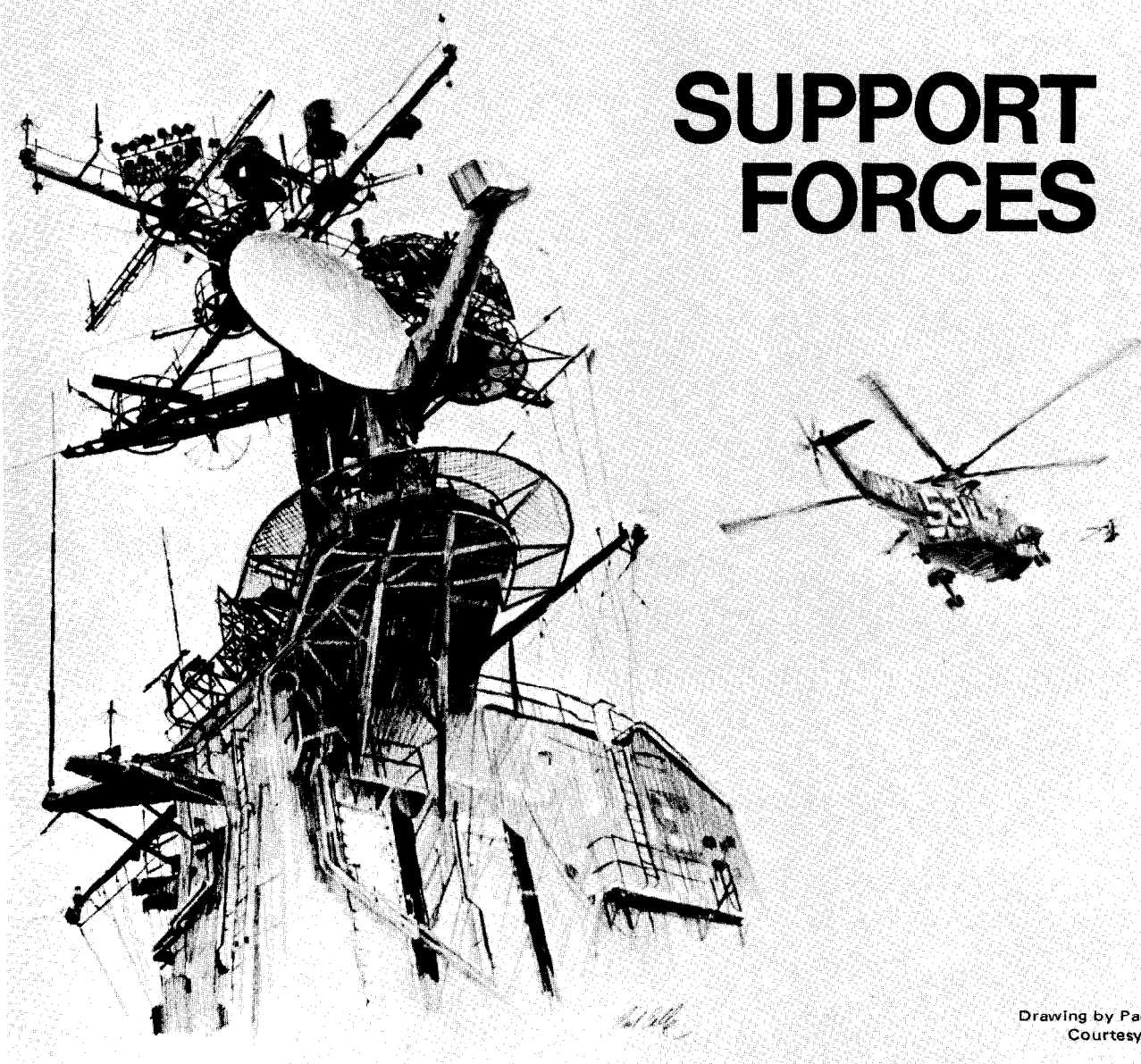


SUPPORT FORCES



Drawing by Paul Calle
Courtesy NASA

Navy support for the American manned space program does not end with research into the upper atmosphere or development of space-related equipment. Day to day support of the NASA program has been and still is an important service provided by Navy units. Beginning before the launch of a manned spacecraft, a 195-pound Navy satellite in earth orbit detects and measures the intense proton streams sent into space by solar flares. The 30-inch diameter *Solrad* satellite developed by the Naval Research Laboratory, was first used at NASA's request to provide information in support of *Apollo 8*. Since then *Solrad* satellites have telemetered simi-

lar data to the Navy's Blossom Point, Md., station to support subsequent *Apollo* flights.

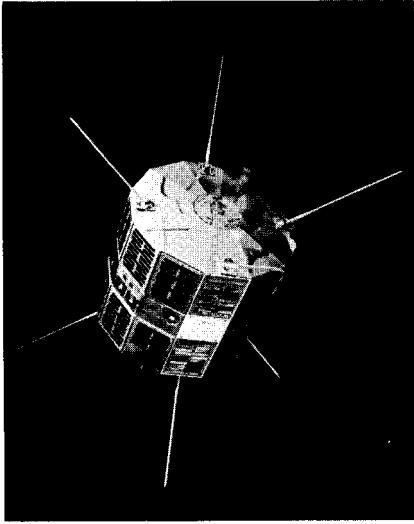
Satisfied that solar radiation presents no obstacle to manned spaceflight, NASA next called on Navy support to tell its launch controllers the precise microsecond at which to launch the spacecraft. Using the ultimate in accuracy — the Naval Observatory's cesium beam atomic clock — NASA controllers are assured of conducting launch, in-flight control and recovery, with the utmost exactness.

As the astronauts lie strapped to their couches in the nose of the launch vehicle awaiting blast-off, they may be comforted by the knowledge that

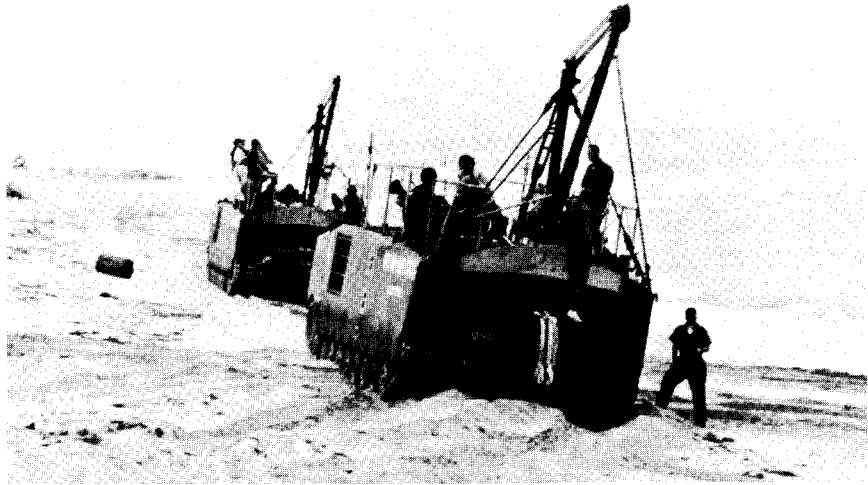
should anything go wrong during lift-off and they are forced to use the emergency escape system to blast clear of an errant booster, the U. S. Marine Corps is standing by on the beach. The Marines manning two amtrac retrievers 6,000 yards from the launch pad are among those nearest to the spacecraft. If *Apollo's* escape system deposits the capsule in the surf or on the beach, the amtracs will rush to rescue the astronauts. Though, fortunately, the Marines have not been called on, they have been on duty for every major space flight since 1965 when NASA first requested that they provide support for the *Gemini* program.

Should an emergency occur further

SUPPORT FORCES



Navy's earth orbiting SOLRAD satellite relays solar activity data for NASA use.



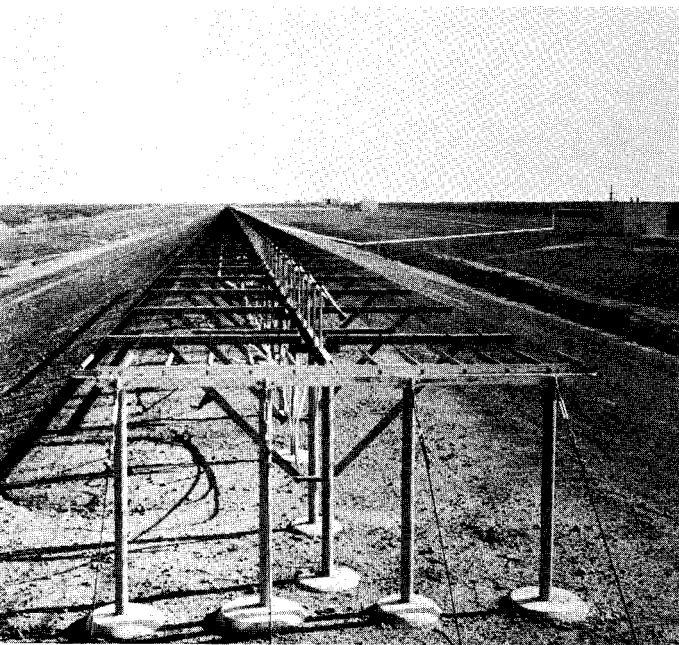
USMC amphibious retriever vehicles stand by on Cape Kennedy beach prior to Apollo launch. Below, RAdm. Davis, TF-130, plans force movements in support of Apollo 13.



into the initial climb toward space, other Navy ships are spotted along the spacecraft's track. In earlier flights this included tugboats and mine-sweepers equipped with Underwater Demolition Team (UDT) swimmers a few miles offshore. A variety of other naval vessels stretch around the globe along the planned flight path.

To control these naval units, the Navy's Manned Spacecraft Recovery Force, maintains 24-hour surveillance of ships' positions and their readiness condition as well as weather conditions in the primary and contingency recovery areas.

The Commander, Manned Spacecraft Recovery Force is responsible for the training of his force in addition to its control and coordination. Some 200 individual ships and large numbers of naval aircraft have participated in recovery operations since the Navy's first involvement in 1958. The recovery forces are divided into two task forces: TF 140, the Atlantic Recovery Force under control of the Atlantic Recovery Control Center (RCCA) at Norfolk, Va., and TF 130 under control of the Pacific Recovery Control Center (RCCP) at Kunai, Hawaii. Either can handle recovery during any



Two-mile-long NavSpaSur transmitter radiates a million watts. Reflected energy detected by receiver sites pinpoints spacecraft.



Sea Kings of HS-4 prepare to launch in support of Apollo recovery operation and are on station well in advance of capsule re-entry.

phase of the mission, and each continually moves its forces to maintain the best recovery positions as the spacecraft's ground track shifts during earth orbit. The recovery ships receive up-to-date information from RCCA, RCCP and NASA's Mission Control Center.

Task Force commanders, utilizing the recovery control centers' complex communications system, are able to maintain voice contact with all ships and aircraft in the recovery force. The Navy communications satellite system, now part of the Defense Satellite Communications Systems (DSCS), contributes to this network of control. In addition, DSCS maintains constant communication with the spacecraft. And, as mentioned previously, the Navy assists NASA, in another way, in maintaining accurate information about a spacecraft. The Naval Space Surveillance System (NavSpaSur) developed for DOD's Advanced Research Project Agency is capable of tracking and identifying space vehicles orbiting the earth. Part of NORAD since 1961 NavSpaSur, through use of its three transmitting and six receiving stations in the southern United States, is able to determine azimuth and zenith angles

used to fix the position of passing spacecraft.

Below, at sea, spread across thousands of miles of ocean, the ships and aircraft of the Manned Spacecraft Recovery Force wait. Destroyers, aircraft carriers and assorted auxiliaries, together with helicopters, carrier-based fixed-wing and land-based patrol aircraft, all there to perform specific missions, remain at the ready for the moment when they will play their part in man's venture into space. As re-entry time draws near, the ships take up their final positions, aircraft are launched and all eyes turn skyward in an attempt to detect the telltale streak of flame marking re-entry. When it comes, and radar and visual contact are made, the recovery ship (normally an aircraft carrier) and its helicopters move toward the exact splashdown point. Should splashdown occur outside the planned area, longer-ranging S-2 *Trackers*, E-1 *Tracers* and P-3 *Orions* are on station waiting to spot the floating capsule, mark its position and radio its coordinates. This seldom occurs, and it is most likely that the first on the scene will be one of the recovery carrier's airborne helicopters.

